

PROGRAMMA 101
PROGRAM LIBRARY INDEX
(with abstracts)

CHEMICAL ENGINEERING

22 0001 Pipeline Pressure Loss

This program computes the pressure loss and Reynolds number for a variable pipe length.

22 0002 Convergence Pressure: Flash Calculation

This program computes the convergence pressure for still product accumulators, using an assumed ratio of moles in vapor to moles in liquid.

22 0003 Multipass and Cross-Flow Exchanger Heat Transfer

This program computes the mean temperature difference, the rate of heat transfer, required steam, and the required area for multipass or cross-flow exchangers.

22 0004 Laminar Flow: Pressure Drop and Velocity

This program computes the pressure drop and velocity for laminar flow in valves, fittings and pipe.

CIVIL ENGINEERING

24 0001 Simple Beam: Intermediately Concentrated Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining an intermediately concentrated load.

24 0002 Simple Beam: Total Uniform Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining a total uniform load.

Civil Engineering (Cont'd)

24 0003 Simple Beam: Partial Uniform Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining a partial uniform load.

24 0004 Simple Beam: Total Triangular Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining a total triangular load.

24 0005 Simple Beam: Symmetrical Triangular Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining a symmetrical triangular load.

24 0006 Simple Beam: Total Trapezoidal Load

This program computes the shearing stress and the bending moment of a beam supported at the extremities and maintaining a total trapezoidal load.

24 0101 Propped Cantilever Beam: Total Uniform Load

This program computes the shearing stress and the bending moment of a beam fixed at one end, supported at the other, and maintaining a total uniform load.

24 0102 Propped Cantilever Beam: Intermediately Concentrated Load

This program computes the shearing stress and the bending moment of a beam fixed at one end, supported at the other, and maintaining an intermediately concentrated load.

24 0103 Propped Cantilever Beam: Uniform Partial Load

This program computes the shearing stress and the bending moment of a beam fixed at one end, supported at the other, and maintaining a uniform partial load.

24 0104 Propped Cantilever Beam: Triangular Load Increasing Uniformly to Fixed End

This program computes the shearing stress and the bending moment of a beam fixed at one end, supported at the other, and maintaining a total triangular load increasing uniformly to the fixed end.

Civil Engineering (Cont'd)

24 0201 Fixed Beam: Intermediately Concentrated Load

This program computes the shearing stress and the bending moment of a beam fixed at both ends and maintaining an intermediately concentrated load.

24 0202 Fixed Beam: Total Uniform Load

This program computes the shearing stress and the bending moment of a beam fixed at both ends and maintaining a total uniform load.

24 0203 Fixed Beam: Partial Uniform Load

This program computes the shearing stress and the bending moment of a beam fixed at both ends and maintaining a partial uniform load.

24 0204 Fixed Beam: Triangular Load Increasing Uniformly to One End

This program computes the shearing stress and the bending moment of a beam fixed at both ends and maintaining a total triangular load increasing uniformly to one end.

24 0301 Embedded Base Simple Frame: Load Concentrated On Overhang

This program computes the bending moment diagram and the vertical and horizontal reactions for an embedded-base simple frame maintaining a concentrated load on an overhang at one end of the frame.

24 0302 Embedded Base Simple Frame: Total Uniform Load

This program computes the bending moment diagram and the vertical and horizontal reactions for an embedded-base simple frame maintaining a total uniform load.

24 0303 Hinged Base Simple Frame: Pier-Bracket Supported Concentrated Load

This program computes the bending moment diagram and the vertical and horizontal reactions for a hinged-base simple frame maintaining a concentrated load by means of a bracket mounted on one pier.

Civil Engineering (Cont'd)

- 24 0304 Two-Story Hinged Base Simple Frame: Total Uniform Load on Lower Level

This program computes the bending moment diagrams and the horizontal and vertical reactions for a two-level hinged base frame maintaining a total uniform load on the lower level.

- 24 0305 Two-Story Hinged Base Simple Frame: Total Uniform Load on Upper Level

This program computes the bending moment diagrams and the horizontal and vertical reactions for a two-level hinged base frame maintaining a total uniform load on the upper level.

- 24 0306 Hinged Base Double Frame: Total Uniform Load

This program computes the bending moment diagrams and the horizontal and vertical reactions for a hinged-base double frame maintaining a total uniform load.

- 24 0307 Embedded Base Double Frame: Total Uniform Load

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded-base double frame maintaining a total uniform load.

- 24 0308 Hinged Base Triple Frame: Total Uniform Load

This program computes the bending moment diagrams and the horizontal and vertical reactions for a hinged-base triple frame maintaining a total uniform load.

- 24 0309 Embedded Base Roof Frame: Total Uniform Load

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded-base roof frame maintaining a total uniform load.

- 24 0310 Embedded Base Triple Frame: Total Uniform Load

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded-base triple frame maintaining a total uniform load.

Civil Engineering (Cont'd)

24 0311 Embedded Base Roof Frame: Vertical Load Distribution

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded base roof frame maintaining a vertical load along the $\overline{BC}$ or $\overline{CD}$ axis.

24 0312 Hinged Base Roof Frame: Vertical Load Distribution

This program computes the bending moment diagrams and the horizontal and vertical reactions for a hinged base roof frame maintaining a vertical load along the $\overline{BC}$ or $\overline{CD}$ axis.

24 0313 Embedded Base Roof Frame: Horizontal Load Distribution

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded base roof frame maintaining a horizontal load along the $\overline{BC}$ or $\overline{CD}$ axis.

24 0314 Embedded Base Roof Frame: Horizontal Load Along Pier

This program computes the bending moment diagrams and the horizontal and vertical reactions for an embedded-base roof frame maintaining a horizontal load along one pier.

24 0401 Beams: Flexure of Bars - Flexural Center for Angle Section

This program computes the position of flexural center for angular sections.

24 0402 Beams: Flexure of Bars - Flexural Center for Channel Section

This program computes the position of flexural center for channel sections in the cases of non-uniform t and uniform t .

24 0402 Beams: Flexure of Bars - Flexural Center for "T" Section

This program computes the position of flexural center for "T" sections.

24 0404 Beams: Flexure of Bars - Flexural Center for "I" Section

This program computes the flexural center for an "I" section with unequal flanges and a thin web.

Civil Engineering (Cont'd)

24 0405 Beams: Flexure of Bars - Solid Circular Section

This program computes the moment of inertia, the neutral axis and the maximum fiber stress for a curved beam in the form of a solid circular section.

24 0406 Beams: Flexure of Bars - Hollow Circular Section

This program computes the moment of inertia, the position of the neutral axis and the maximum fiber stress for a curved beam in the form of a hollow circular section.

24 0501 Earthwork and Grade: Area of Sections

This program computes the area of sections for the following instances: a) where the roadway is all in cut; b) where the roadway is all in fill; c) where the roadway is partly in cut; and d) where the roadway is partly in fill.

24 0502 Earthwork and Grade: Volumes by End Area

This program computes volumes by end area method, utilizing direct planimeter readings.

24 0503 Earthwork and Grade: Area within Closed Traverse

This program computes the area within a closed traverse, utilizing the double-meridian-distance method.

24 0504 Earthwork and Grade: Latitudes and Departures

This program computes the latitudes and departures for a closed traverse, given bearing angle and distance for each course.

24 0601 Soil Mechanics: Embankment Foundation Stability - Single Layer

This program computes the net driving moment, the net resisting moment and the safety factor for any single layer based embankment for either an assigned radius of failure or for a calculated radius of failure.

24 0602 Soil Mechanics: Embankment Foundation Stability - Double Layer

This program computes the net driving moment, the net resisting moment and the safety factor for any double layer based embankment for either an assigned radius of failure or for a calculated radius of failure.

ELECTRICAL ENGINEERING

26 0003 Circuit Design

This program performs several computations useful in designing electronic circuits.

26 0004 Effects of Temperature on Resistors ($^{\circ}\text{C}$)

This program computes the change in resistance value due to large or small temperature changes.

26 0005 AC Series R-C Circuit

This program computes characteristics of an alternating current series R-C circuit where inductance is negligible.

26 0006 AC Series Capacitive R-L-C Circuit

This program computes characteristics of an alternating current capacitive R-L-C circuit.

26 0007 AC Series Inductive R-L-C Circuit

This program computes characteristics of an alternating current inductive R-L-C circuit.

26 0008 AC Series Resonant Circuit

This program computes the characteristics of an alternating current series resonant circuit, where the inductive reactance is equal to the capacitive reactance and the voltage drop across the coil(s) is equal to the voltage drop across the resistor(s).

26 0009 AC Series Parallel Circuit

This program computes the characteristics of a simple alternating current parallel circuit with R in one branch and L in another.

26 0010 AC Parallel Circuit with R in Both Branches

This program computes characteristics of an AC parallel circuit with R in both branches.

26 0011 AC Parallel Circuit with R and L in Each Branch

This program computes characteristics of an alternating current parallel circuit with R and L in each branch.

Electrical Engineering (Cont'd)

26 0012 Transistorized Bistable Multivibrator Design (Flip-Flop)

This program solves the circuit design for the DC portion of a transistorized flip-flop on the assumption that Q_1 is in saturation, that Q_2 is cut off and that there is no loading of the circuit by external circuitry.

26 0013 Bundled Wire Current Rating

This program computes the safe current rating for bundled insulated wire conductors for use in control and instrumentation equipment consisting of five or fewer types of wire.

MECHANICAL ENGINEERING

29 0001 Coil Spring Design

This program computes the maximum safe load and the deflection per active coil for any round cross-section coil spring.

29 0002 Contact Stress: Two Cylinders; Cylinder in Circular Groove; Cylinder on Flat Plate

This program computes the contact stress for the following cases: a) two cylinders with parallel axes; b) cylinder in a circular groove; and c) cylinder on a flat plate.

29 0003 Helical Spring Design

This program gives design parameters for a helical spring, given the desired load, coil diameter, allowable stress, desired spring rate and the rigidity modulus.

29 0004 Ring Distortion: Equal and Equidistant Concentrated Loads

This program computes the maximum bending, maximum torsion, maximum deflection, maximum slope and the maximum angular twist for a circular ring subject to k equal and equidistant concentrated loads and supported on k equidistant supports.

OPTICAL ENGINEERING

31 0001 Third Order Aberration Analysis

This program traces two paraxial rays through j surfaces utilizing the method outlined in the Military Standardization Optical Design spec MIL-HDBK 141.

31 0002 Ray Tracing by PR Method

This program utilizes the PR Ray Trace method for a one ray trace through j surfaces.

31 0003 Geometric Ray Trace

This program utilizes a geometric procedure for tracing a ray through two surfaces. The method is applicable only for a ray parallel to the optical axis.

FINANCE

34 0110 Simple Interest: Interest and Principal Accumulations

This program solves the following formula:

$$\text{Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Days}}{360}$$

and accumulates both principal and interest.

34 0121 Compound Interest: Uniform Series (Annuity)

This program determines the amount to which a uniform series of payments will grow over a given period of time if money is compounded at a certain interest rate.

34 0130 Sinking Fund: Determine Payment

This program determines the payment that must be made in each period in order to obtain a certain amount at the end of a given time if interest is compounded at a given rate.

34 0140 Present Value: Single Payment

This program computes the present value of an amount that will be received or paid at the end of a given period of time, valued at a particular interest rate.

Finance (Cont'd)

34 0141 Present Value: Determine Payment

This program determines the uniform payments that must be made to reduce a principal in a certain period of time if interest is compounded at a certain rate.

34 0142 Present Value: Determining Present Value of an Annuity

This program determines the present value of an annuity and computes the value of a series of uniform payments made over a given period of time, compounded at a given interest rate.

34 0146 Present Value: Non-Uniform Series

This program determines the present value of a series of unequal payments or receipts.

34 0210 Installment Loans: Rebate

This program computes the interest rebate allowed on an installment loan which is repaid prior to maturity.

34 0220 Installment Loans: Percent of Delinquent Loans

This program calculates both the number and dollar percentages of delinquent loans to total loans within certain categories (i.e., automobile, personal, mortgage, etc.).

34 0230 Installment Loans: Accrual by Diminishing Balance

This program computes the portion of the unearned discount of a discounted loan that is added periodically (usually monthly) to current earnings.

34 0312 Computation of a Constant Payment to Amortize a Mortgage and Mortgage Schedule

This program computes the monthly payment needed to amortize both principal and interest over a given period of time and prints a schedule of the interest and principal portions of the payment.

34 0320 Mortgage Schedule: Constant Payment - Principal and Interest

This program computes the portion of each mortgage payment that applies to principal, the portion that applies to interest and the new balance.

Finance (Cont'd)

- 34 0321 Mortgage Schedule: Constant Payment - Allow for Insurance and Taxes

This program performs the same computations as 34 0320 but allows for payment of insurance and taxes.

- 34 0330 Mortgage Schedule: Constant Principal Payment with Interest Accumulation

This program computes the mortgage schedule for loans amortized by periodic payments that do not include interest. The schedule shows the interest on the declining principal balance and the total payment required.

- 34 0340 Monthly Mortgage Statement

This program computes a monthly mortgage statement for commercial mortgage holders, showing the balance as well as the additions and deletions to the account during the month. Interest is computed on the daily balances.

- 34 0345 Mortgage: Satisfaction Remittance

This program computes the interest and service charges to determine the amount to be paid the seller in satisfaction of his equity. The following formulas are used:

$$a) \text{ Interest} = \frac{\text{Principal} \times \text{Annual Interest Rate} \times \text{Days}}{360}$$

$$b) \text{ Service Charge} = \frac{\text{Interest} \times \text{Service Charge Rate}}{\text{Annual Interest Rate}}$$

$$c) \text{ Satisfaction Remittance} = (\text{Principal} + \text{Interest}) - \text{Service Charge}$$

- 34 0420 Trust Accounting: Commission Schedule

This program computes the commission on trust accounts handled by fiduciary institutions whose fee is based upon the amount of principal handled. The program also accumulates a grand total of the commissions from account to account.

- 34 0430 Trust Accounting: Income Determination

This program evaluates, for commission purposes, trust portfolios consisting of stocks and bonds, determining the total income for the fund by computing the interest and dividends received on the securities.

Finance (Cont'd)

34 0440 Trust Fund Proration: Amounts and New Components (Increment)

This program prorates an amount added to a trust fund over various components of the fund.

34 0520 Savings Accounts: Interest Determination - Low Balance

This program compounds and credits interest on savings accounts according to the low balance of the account for the period in question.

34 0540 Daily Interest Factors: Savings Accounts (90-Day Quarter)

This program computes daily interest on deposits or withdrawals by computing the interest factor for a specified interest rate.

34 0710 Valuation of an Oil or Gas Production Payment

This program computes the value of an oil or gas producing property in order to substantiate collateral for loans.

34 0711 Present Value of Cash Flow of an Oil Production Payment

This program determines the present value of the portion of gross income from an oil well that is set aside each year for investment. It determines the present value of that portion at a given interest rate and accumulates the sum of the present values.

34 0721 Determining Net Profit or Loss on an Account

This program computes the profit or loss on accounts by analyzing the average collected balance, the number of months, the activity cost and the average book balance. Subtractions are made for various constant charges and the computer prints the available balance after reserve, the income on available balance, the total activity cost and the total expenses as well as the profit or loss.

34 0731 Currency Conversion: To or from the Currencies of the U.S., Great Britain, Germany, France, Italy

34 0732 Currency Conversion: British Pounds, Shillings & Pence to and from U.S. Dollars

34 0733 Currency Conversion: To and from Dollars

Finance (Cont'd)

34 0734 Currency Conversion: To and from Dollars (includes Shillings)

34 0739 Arbitrage

This program immediately converts the rate of exchange of one currency (expressed in dollars) to its equivalent value in the currencies of six other countries.

34 0745 Dollar Days

This program permits the computation of interest on loans on a daily basis by computing dollar days, or the amount of money outstanding multiplied by the number of days it has been outstanding. This figure, divided by the total amount loaned, yields the average number of days the average loan was outstanding, and the interest for that period can then be computed.

GENERAL

37 0101 Conversion: Degrees (or Hours), Minutes and Seconds to Whole Amounts and Sub-Units

This program adds a series of non-decimal amounts consisting of degrees (or hours), minutes and seconds and prints the correct converted sum.

37 0102 Common Conversions: Units to Whole Amounts and Units

This program adds a series of non-decimal amounts (i.e., feet and inches, pounds and ounces, quarts and ounces, hours and minutes) and prints the correct converted sum.

37 0103 Conversion: Liquid Measure Units to Whole Amount and Units

37 0104 Conversion: Fahrenheit to Centigrade and Centigrade to Fahrenheit

37 0105 Conversion: Metric System to U.S. System

37 0106 Conversion: U.S. System to Metric System

37 0107 Conversion: Miles/Hour to: Feet/Minute, Feet/Second, Kilometers/Second, Knots

General (Cont'd)

37 0204 Economic Service Life Calculation

This program computes the economic life of a piece of equipment by analyzing the investment and maintenance costs and determining when it is no longer economical to maintain the equipment.

37 0301 Discount and Net (with Total Gross, Total Discount Amount and Total Net)

This program computes the discount on a group of prices and accumulates the totals of the original costs, the discount amounts and the net amounts.

37 0302 Any Invoice

This program computes the invoice for a group of items with varying discount percentages, varying taxes and quoted in varying units (i.e., dozens, hundreds, gross, etc.).

37 0320 Invoice: Discounts, Nets, Grand Total

This program computes an invoice consisting of a series of items with varying discount and tax rates and prints the total discount amount, total net amount and grand total.

37 0321 Inventory or Invoice to Grand Total

This program solves a simple invoice or inventory problem, multiplying item by price and accumulating the totals.

37 0401 Payroll: Labor Cost Distribution - Deductions from Table

This program computes the payroll for employees working at more than one job paying more than one rate, allows for entry of the deductions from a table and prints the total earnings, total hours and average hourly rate.

37 0402 Payroll: Labor Cost Distribution - Deductions Computed

This program performs the same computations as 37 0401 but computes the deductions after the operator enters the rate.

General (Cont'd)

- 37 0403 Payroll: Incentive Rate, Minutes Earned - Deductions from Table

This program computes the payroll for employees whose base rate depends upon amount of production, allows for entry of deductions from a table, and prints the gross earnings, total deductions and net pay.

- 37 0404 Payroll: Incentive Rate, Minutes Earned - Deductions Computed

This program performs the same computations as 37 0403 but computes the deductions after the operator enters the rate.

- 37 0405 Basic Payroll: Deductions from Table

This program computes the weekly wage for those employees paid on the basis of a weekly rate plus an overtime factor for overtime hours. The deductions are then taken from a table and the total earnings are printed, as well as company-wide totals for the various deductions.

- 37 0406 Basic Payroll: Deductions Computed

This program performs the same computations as 37 0405 but computes the deductions after the operator enters the rate.

- 37 0407 Payroll: Salary and Commissions - Deductions from Table

This program computes the payroll for those employees paid on a salary-plus-commission basis, with the commission rate depending upon the particular product involved. Deductions are entered from a table.

- 37 0408 Payroll: Salary and Commissions - Deductions Computed

This program performs the same computations as 37 0407 but computes the deductions after the operator enters the rate.

- 37 0409 Computing Time Card Hours

This program computes the hours worked after the operator enters a series of "time in" and "time out" figures from a time card, and prints the regular and overtime hours worked.

General (Cont'd)

37 0501 Proration: Dollar Distribution/Percentage Distribution

This program prorates any amount and distributes it to a series of amounts in the proportion that the individual amounts bear to each other.

37 0502 Automatic Proration and Distribution

This program prorates an amount to be added to the total of a series of components, printing the original total, the prorated components and the new total.

37 0503 Expense Distribution

This program distributes dollar amounts or other values according to categories, prints the total for each category and the grand total for all categories.

37 0520 Fixed Percentage Prorations

This program prorates entered amounts according to predetermined percentages which are stored in the computer.

37 0521 Fixed Percentage Proration: Unlimited Number of Percentages

This program performs the same computations as 37 0520 but is designed to handle an unlimited number of percentages.

37 0522 Factors for Fixed Percentages

This program is designed to be used in conjunction with 37 0520 or 37 0521. It converts a series of predetermined percentages to a complex number which is stored and used in the above programs.

37 0531 Percentage Increase or Decrease with Accumulations

This program computes the increase or decrease between the individual and total amounts representing two sets of figures (i.e. budgeted expenses vs. actual expenses) and prints both the amount and the percent of change.

37 0532 Constant Divisor Percentage Calculation

This program computes the percentage of various amounts to a single fixed amount, such as shares voting to total shares eligible to vote, and prints the total percentage.

General (Cont'd)

37 0601 Period Difference Analysis: One Comparison

This program computes the difference between two sets of figures, accumulating and printing the difference between individual figures as well as the total difference between sets.

37 0602 Period Difference Analysis: Two Comparisons

This program computes the difference between three sets of figures, accumulating and printing the totals of the entered figures to show the total differences for each group of figures.

37 0801 Labor Cost Report

This program computes the "to date" and "period" costs for each sub-job in a construction or other project and breaks this figure down into mechanics' labor and laborers' labor. In addition, it computes the percentage of labor costs-to-date to estimated labor costs.

37 0802 Indicated Outcome Report: Construction

This program permits an evaluation of the costs of a construction project by making a projection of final costs on the basis of costs-to-date and comparing that figure with the estimated total costs for the project.

37 0810 Revenue Proportion: Railroads

This program determines the proportion of revenue due each railroad when several railroads are involved in a particular shipment. The revenue is computed for each segment of the weight, allocated according to percent of total weight, and accumulated to yield the total revenue for each railroad as well as the total for all railroads..

37 0811 Depreciation Accrual: Railroads

This program computes the accrued depreciation on capital equipment owned by railroads.

INSURANCE

40 0221 Experience Rating and Summary Sheet

This program determines credibility, final adjusted losses and experience modification ratio based on an analysis of current premiums, expected losses and actual losses.

40 0901 Cancellations, Endorsements: Pro-Rata and Short Rate

This program calculates the amounts of earned and unearned premium when an insurance policy is cancelled before its normal expiration date.

MATHEMATICS

45 0001 Common Logarithm

This program computes the common logarithm of a number, x , normalized for input as: $x = x \cdot 10^m$; $1 \leq x < 10$.

45 0002 Common Logarithm

This program computes the common logarithm of a number, x , normalized for input as: $x = x \cdot 10^m$; $1 \leq x < 10$. It is faster but less precise than 45 0001.

45 0003 Common Logarithm

This program computes the common logarithm of a number, x , normalized for input as: $x = x \cdot 10^m$; $1 \leq x < 10$. This program, unlike the preceding two programs, requires only three coefficients for the computation.

45 0004 Natural Logarithm

This program calculates the natural logarithm of a number using the method of program 45 0003.

45 0005 Natural Logarithm

This program computes the natural logarithm of a number, x , $1 \leq x < 10$, by means of a Tchebycheff Series. The maximum error = +2, -4 on the last decimal digit.

Mathematics (Cont'd)

45 0006 Natural Logarithm

This program computes the natural logarithm of a number, x , $1 \leq x < 10$, by means of a Tchebycheff Series. The maximum error is ± 2 on the last decimal digit.

45 0101 Exponentials 10^x , e^x

This program calculates e^x for $-8.999 < x < 9.999$ with the first ten terms of a McLaurin Series.

45 0102 Exponential 10^x

This program computes the exponential 10^x by means of a Tchebycheff Series with the substitution: $z = 2x - 1$. The maximum error = ± 5 on the last decimal digit.

45 0103 Exponential 10^x

This program computes the exponential 10^x by means of a Tchebycheff Series with the substitution: $z = 2x - 1$. The maximum error = ± 4 on the last decimal digit.

45 0104 Negative Exponential e^{-x}

This program computes the negative exponential of a number using a ratio of two fourth-degree polynomials.

45 0105 $1 - e^{-x}$

This program computes $1 - e^{-x}$ in an analogous way to that of the preceding program, but the number of decimal places is limited to a maximum of 6.

45 0201 Sine, Cosine

This program computes the sine or cosine of an argument, x , given in either degrees or radians.

45 0202 Sine, Cosine, Tangent

This program computes the sine, cosine or tangent of an argument, x , given in either degrees or radians.

Mathematics (Cont'd)

45 0203 Sine, Cosine, Tangent

This program performs the same computations as 45 0202, but uses a Tchebycheff Series with five coefficients and is faster than 45 0202.

45 0204 Sine, Cosine, Tangent

This program performs the same computations as 45 0202, but uses a Tchebycheff Series with four coefficients.

45 0205 Sine, Cosine

This program computes the sine and cosine of an argument in either degrees or radians, using a Tchebycheff Series with five coefficients.

45 0206 Sine, Cosine

This program computes the sine and cosine of an argument in either degrees or radians, using a Tchebycheff Series with three coefficients.

45 0207 Sine, Cosine

This program computes the sine and cosine of an argument in either degrees or radians, using a Tchebycheff Series with two coefficients.

45 0301 Arcsine

This program computes the arcsine of an argument by means of a Tchebycheff Series with six coefficients.

45 0302 Arcsine

This program computes the arcsine of an argument using a Tchebycheff Series with four coefficients.

45 0303 Arctangent

This program computes the arctangent of an argument, x , using a Tchebycheff Series with six coefficients.

Mathematics (Cont'd)

45 0304 Arctangent

This program computes the arctangent of any positive argument, x , using a Tchebycheff Series.

45 0401 Hyperbolic Sine

This program computes the hyperbolic sine of an argument using a McLaurin Series.

45 0402 Hyperbolic Cosine

This program computes the hyperbolic cosine of an argument using a McLaurin Series.

45 0403 Hyperbolic Tangent

This program computes the hyperbolic tangent of an argument using a McLaurin Series for $\sinh x$.

45 0501 Factorial: $n!$, $2n!!$, $(2n-1)!!$

This program computes factorials and semi-factorials.

45 0502 Factorial: $n!$ Normalized

This program computes $n!$ and prints the result in normalized form.

45 0503 Gamma Function: $\Gamma(1+x)$ 45 0601 Bessel Function of the First Kind - Zero Order: $J_0(x)$

45 0901 Complex Product, Quotient and Reciprocal

This program computes the product, quotient or reciprocal of a complex number introduced as a real part and an imaginary part.

45 0902 Complex Square Root

This program computes the two conjugate roots of a complex number which is introduced as its real and imaginary parts.

45 1001 Number System Conversion from a Fixed Limit

This program will convert an integer, n , given in the decimal system, to an equivalent integer in a number system, b , where $2 \leq b < 10$.

Mathematics (Cont'd)

- 45 1002 Decimal to Binary Conversion for Routines Requiring a Decimal Setting of 2
- 45 1103 Polynomials (Non-Homogeneous up to Eighth Degree)
- 45 1203 Nth Root
- 45 1301 Solution of Second Order Symmetric Linear Systems (Method of Gauss - Single Division)
- 45 1303 Solution of Second Order Symmetric Linear Systems (Square Root Method)
- 45 1310 Solution of Second Order Linear Systems (Method of Gauss - Single Division)

PHYSICS

- 48 0001 Particle Decay

This program identifies a Λ^0 Decay event by comparing the solution of mass with the known mass of the particle

- 48 0002 Energy of Mass Due to Scattering

This program computes the energy of a particle after it has been scattered through an angle ψ .

- 48 0003 Energy Release Due to Scattering

This program computes a quantity of energy, Q , called the energy release, resulting from a nuclear scattering experiment.

SECURITIES

- 64 0301 Securities Broker: Producer's Salary Computation

This program computes commissions, based on multiple commission percentages, net pay and commissions paid by the firm for registered representatives' salaries.

Securities (Cont'd)

- 64 0401 Calculation of Interest Rate: Bond Rollover
- 64 0402 Determination of Cost and Yield of a Semi-Annual Bond (184-Day Factor)

STATISTICS

- 68 0101 Calculation of the Arithmetic Mean: Ungrouped Data
- 68 0102 Calculation of the Arithmetic Mean: Grouped Data - Partially Coded Method
- 68 0103 Calculation of the Arithmetic Mean: Grouped Data - Fully Coded Method
- 68 0104 Calculation of the Arithmetic Mean: Grouped Data - Long Method
- 68 0110 Calculation of the Harmonic Mean: Ungrouped Data
- 68 0111 Calculation of the Harmonic Mean: Grouped Data
- 68 0112 Calculation of the Harmonic Mean: Both Grouped and Ungrouped Data
- 68 0116 Computation of the Weighted Average
- 68 0118 Calculation of the Quadratic Mean
- 68 0120 Calculation of the Median
- 68 0126 Computation of the Arithmetic Progression
- 68 0130 Calculation of the Geometric Progression
- 68 0201 The Calculation of Chi Square with the Observed and Expected Frequencies Given
- 68 0202 The Calculation of Chi Square with the Observed and Expected Frequencies Given

This program computes Chi Square when the observed and expected frequencies are given and the expected frequencies are not the same for all events. If the expected frequencies are the same for all events, 68 0201 is used.

Statistics (Cont'd)

- 68 0412 Calculation of Variance: Both Grouped and Ungrouped Data
- 68 0501 Calculation of the Standard Error of Mean
- 68 0502 Calculation of the Standard Error of Median
- 68 0503 Calculation of the Standard Error of a Proportion
- 68 0504 Calculation of the Standard Error of Standard Deviation
- 68 0505 Calculation of the Standard Error of Mean Deviation
- 68 0506 Calculation of the Standard Error of the Coefficient of Variation
- 68 0507 Calculation of the Standard Error of the Difference Between Two Means
- 68 0601 Calculation of the Coefficient of Rank Correlation (Spearman's Coefficient)
- 68 0602 Calculation of the Rank Correlation Coefficient (Spearman's) and of the Standard Error
- 68 0603 Coefficient of Correlation (Pearson's Correlation Coefficient)
- 68 0604 Calculation of an Estimate of the Standard Error of Correlation Coefficient
- 68 0605 Calculation of Zero Order Coefficients of Correlation Among Three Variables, X, Y and Z
- 68 0606 Calculation of the Partial Correlation Coefficients Among Three Variables, X, Y and Z
- 68 0607 Calculation of the Partial Correlation Coefficients Among Three Variables
- 68 0608 Calculation of the Coefficient of Multiple Correlation Among Three Variables (Simple Correlation Coefficients Given)
- 68 0609 Calculation of the Coefficients of Multiple Correlation Among Three Variables
- 68 0610 Calculation of the Phi Correlation Coefficient
- 68 0701 Calculation of T Test of a Difference Between Two Sample Means

Statistics (Cont'd)

- 68 0702 Calculation of T Test of a Difference Between Two Sample Means
- 68 0703 Calculation of Difference Between Two Sample Proportions
- 68 0704 T Test for Difference Between the Means of Paired Observations
- 68 0705 Calculation of Signed Rank Test
- 68 0800 Calculation of Means, Standard Deviations and Simple Correlation Coefficients Between Pairs of Variables
- 68 0801 Calculation of Squares and Cross-Products of Raw Data (Five Variables at a Time)
- 68 0802 Calculation of Logarithms of Raw Data (Five Variables at a Time)
- 68 0840 Calculation of Chi Square for Linear Functions of Five or Less Independent Variables

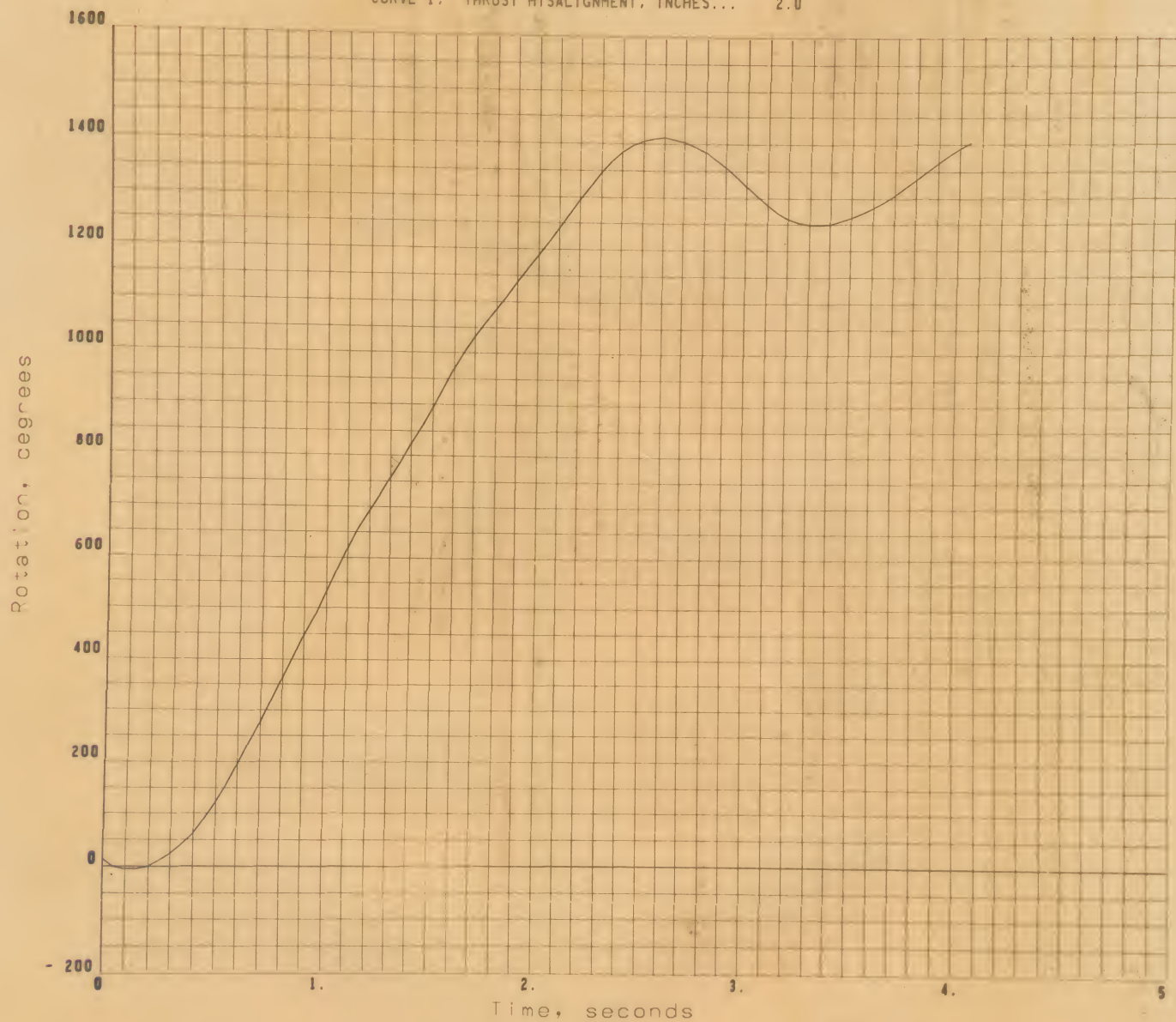
Egress Trajectory

MB Stability Tests

Test 5

07/27/65

CURVE 1, THRUST MISALIGNMENT, INCHES... 2.0



Initial Conditions

Test 5

MB Stability Tests

07/27/65

CURVE 1, THRUST MISALIGNMENT, INCHES... 1.3

TIP-OFF VELOCITY CONST, RAD/FT	0.01	0 VELOCITY TIP-OFF, RAD/SEC...	-7.00
AIRCRAFT VELOCITY, KNOTS.....	0.	EXIT VELOCITY, FT/SEC.....	60.
AIRCRAFT PITCH ANGLE, DEGREES.	0.	EXIT ANGLE, DEGREES.....	0.
ROTATION, DEGREES.....	16.	FUEL WEIGHT, POUNDS.....	16.0
BURN TIME, SECONDS.....	0.67	THRUST, POUNDS.....	5050.
TOTAL WEIGHT, POUNDS.....	442.	MOMENT OF INERTIA, SLUG FT SQ.	31.0
THRUST ANGLE, DEGREES.....	0.	SEAT AREA, SQ FT.....	5.00
SEAT LENGTH, FEET.....	3.34	H. CG POSITION, INCHES.....	9.5
V. CG POSITION, INCHES.....	28.9	DROGUE TIME CONSTANT, FEET....	100.00
DROGUE DIAMETER, FEET.....	5.0	DROGUE RELEASE TIME, SECONDS..	0.70
DROGUE CD.....	0.80	MAIN TIME CONSTANT, FEET.....	400.00
MAIN DIAMETER, FEET.....	29.7	MAIN RELEASE TIME, SECONDS....	1.80
MAIN CD.....	0.75	AIRCRAFT ANGLE OF ATTACK, DEG.	0.
PILOT WEIGHT, POUNDS.....	185.	SEPARATION TIME, SECONDS.....	10.00
Y COORD TOP VERNIER, IN.....	0.	THRUST TOP VERNIER, LBS.....	0.
INITIAL TIME TOP VERNIER, SEC.	0.	BURN TIME TOP VERNIER, SEC....	0.
Y COORD BOTTOM VERNIER, IN....	6.00	THRUST BOTTOM VERNIER, LBS....	2000.
INITIAL TIME BTM VERNIER, SEC.	-0.	BURN TIME BOTTOM VERNIER, SEC.	0.10
INITIAL ROCKET TIME, SECONDS..	0.	INTERMEDIATE TIME CONST, FEET.	25.00